United States Department of the Interior
NATIONAL PARK SERVICE
COASTAL RESEARCH CENTER
COOPERATIVE PARK STUDIES UNIT
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Narragansett, Rhode Island 02882-1197

IN REPLY REFER TO:

14 January 1992

MEMORANDUM

To: Resource Management Specialist, Cape Cod National Seashore, MA
Park Scientist, Cape Cod National Seashore, MA
✓Biotechnician, Cape Cod National Seashore, MA
Field Representative, U.S. Forest Service, Durham, NH
Entomologist & Acting Director, APHIS, USDA, Otis ANGB, MA
Chief, Office of Scientific Studies, NARO, National Park Service, Boston, MA
Director, National Park Service Coastal Research Center, Univ. Rhode Island

From: Invertebrate Ecologist, National Park Service Coastal Research Center, Univ. Rhode Island

Re: Sampling protocol for browntail moth, *Euproctis chrysorrhoea*, on Cape Cod, 1991/92

The sampling protocol presented below is the final version of the OPERATIONAL SAMPLING SCHEME (see MEMORANDUM, 7 January 1992) for the 1991-1992 sampling season. This OPERATIONAL SAMPLING SCHEME can be further revised based on our experience with the 1991-92 sampling effort.

OPERATIONAL SAMPLING SCHEME

- Samples will be taken along transects (or strips) placed every 4 km from the tip of Cape Cod (near Herring Cove Beach) to the area of Coast Guard Beach; a total of 10 transects. The number of transects can be increased (to say, one every 2 km) to get better resolution in areas of special interest, or if sampling goes quickly enough to allow us to double the number of samples.

- Transects will be placed by drawing a line on a map or aerial photo along the center of the Cape (halfway between the Bay and Ocean shores). Each transect will go through a point 4 km along this central line from the previous

transect. The transect will be the shortest line between the Bay and Ocean shores that passes through the 4 km point.

- Appropriate habitat for browntail moth (patches of forest and/or shrubby vegetation) will be delineated along each transect using aerial photographs. Only appropriate habitat along each transect will be included in the sampling scheme.

- Permanent quadrats measuring 10m X 10m will be placed randomly (using a random number table) in appropriate habitat along each transect. Initially, a total of 10 quadrats will be placed on each transect (this number can be modified based on the amount of time required to collect the data). Each quadrat will straddle the transect line, 5m on each side (you could view this as a 10m-wide strip, with 10m lengths being sampled). Each quadrat will be marked at two or more standard points (e.g., two standard corners) and landmarks will be noted so the same quadrats can be found for future samples.

- Twenty five points, arranged as a 5 x 5 grid with 2m between points (1m from each edge of the quadrat), will be placed in each quadrat. This will be accomplished by marking points along two perpendicular edges of the quadrat at the following distances from the corner: 1m, 3m, 5m, 7m, 9m. The investigator will find each of the 25 sampling points by sighting along two edge points, drop a plumb line, and record the following information for each of the 25 sampling points in each quadrat:
    - ~ The woody plant species nearest each sampling point (if two or more plants are equidistant, record all of them). If the same plant, or the same patch of a plant covers more than one sampling point, record this (e.g., by identifying each patch with a letter). Record the number of winter webs of browntail moth larvae on the plant or patch. This sampling method applies to shrubs and trees (use binoculars for web counting in trees, if necessary). Each point can be considered the center of a 2m x 2m subquadrat (25 subquadrats in the quadrat).
    - ~ The tree canopy will be sampled during spring (after leaf out), summer or fall. At each sampling point, the investigator will sight up along a short plumb line held overhead and record the tree species (more than one species if present) with leaves above the sampling point. Also, species and diameter at breast height (dbh) will be recorded for all trees within the quadrat with dbh ≥1 inch. Trees with multiple trunks will be recorded as separate trees if the split is below breast height, but the investigator will note that the trees are actually multiple trunks of one tree.

~ Probably the best way to record the data would be by labelling each sample point (e.g., A-1, A-2,...A-5, B-1,...E-5), identifying each plant with a species code (e.g., PM for *Prunus maritima*), a lowercase letter to identify the patch (if a patch covers more than one sampling point), and a number representing the total # winter webs in the patch.

~ Record winter web density in the entire quadrat (counts of the total number of winter webs in the quadrat, or estimates based on random subsamples if the webs are too numerous for direct counting).

- The investigator will also walk the length of each transect recording vegetation types along the transect, and will note any clusters of webs along the transect. The location of each web cluster and the total number of webs will be recorded.

- Plant damage will be assessed in the quadrats in summer (after the larvae pupate), using transparency methods developed by the U.S. Forest Service. The investigator will be instructed in these techniques by Forest Service personnel.

The cover of each plant species (estimated by frequency), percent of patches infested, and web densities can be compiled later from these data sheets. All woody plant species will be sampled. This will allow comparisons of web densities along the Cape through time, even though different plant species predominate in different parts of the Cape.

Winter webs will be collected from each quadrat (one web from each of one or two selected plant species). The webs will be collected at random (e.g., the web closest to a random point in the quadrat), and will be returned to the lab for examination. The webs will be placed in solution (a weak KOH solution, details to be determined by initial trials) and the larvae counted in the lab. The number of larvae per web, average larval lengths (or weights), and percent of larvae that are healthy (vs. parasitized) will be recorded, if possible. Techniques for handling *E. chrysorrea* will be developed (protective clothing,, details of manipulation in the field and lab).

Each transect will represent a sample at a given point along the Cape. The data from the quadrats can be analyzed to yield average cover by each plant species, average percent of plants (or patches) infested, average density of infestation, average larval density in webs, average size of larvae, and average parasitism rate of larvae at each point along the Cape. The data can be analyzed with standard ANOVA techniques, and trends can be compared from year to year.

This sampling program will be applied only to NPS land on the Cape for the 1991-92 season. Private lands may be included in subsequent years. The data from these samples can be compared with pheromone trap data being collected by APHIS personnel on the Cape. Trap data can be interpreted in relation to web densities the previous and subsequent winters, and to plant damage data from the summer samples.

I would appreciate hearing any additional comments about this sampling program. I think it will solve the variability problems inherent in some of the early studies and will allow analysis of changes through time in the distribution of *E. chrysorrhoea* on Cape Cod. Please send me your suggestions or call me at (401) 792-4537. Thanks for your input.

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Forest Questions
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- small to 1" or larger
2.5cm